REMARKS

The non-final Office Action (NFOA) mailed December 24, 2008, has been carefully considered and these remarks are responsive thereto. Applicants respectfully request reconsideration of pending claims 1-27 and address the several rejections made by the Examiner and answer each of his questions concerning the specification and support for the claims in the order presented by the Examiner in his NFOA.

Firstly, Applicants wish to note for the Examiner's behalf that in the **Office Action Summary**, under Attachments, box 3) is incomplete and should read 11/19/08. If the Examiner disagrees, please advise Applicants in a next Office Action.

Claim Rejections – 35 USC 112

Now turning to the **DETAILED ACTION** beginning at Page 2, pending claims 1-27 are rejected: "The claim(s) contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the invention." The claims are directed to acoustic echo canceller apparatus for use in personal computers and peripheral devices. It is respectfully submitted that one skilled in this art would have at least a bachelor of science degree in electronics engineering and experience in computer programming as well as approximately two years of experience in the art. If the Examiner agrees with this level of experience which is actually less than the experience level of the Applicants, Applicants must respectfully traverse. Applicants will now address each comment or question made by the Examiner at section 2), Pages 2-5.

The Examiner states: The claims recite an entertainment (non-trainng) audio signal sampled at a higher sampling rate than the first sampling rate of the input microphone. Applicants' specification does not disclose any means or relationships between sampling rate of the incoming microphone signal (telecommunications signal) and the 'higher sampling rate' of the non-training audio signal. Applicants do not show a sampling stage in any of the submitted figures. Additionally, it is not clear how the 'non-training' signal is presented to the user if it is not converted to an analog signal to be driven out of the speaker (in order to perform the claimed 'training function'). Applicant's specification does not specify if/when/where the signal is converted to analog. Is applicant claiming an 'entertainment audio signal' that is transmitted out to through the speaker in digital form? That does not make sense as that would not be a very

'entertaining' signal." This quotation will be responded to first as further comments/rejections of section 2. are related to different subject matter. The quotation is broken down into the following: Sampling rate and Digital to Analog/Analog to Digital where a speaker should receive analog and analog from a microphone would be converted to digital in a related device such as a personal computer, related device or peripheral and related nonsensical transmission of digital through a speaker.

Sampling Rate

It is respectfully submitted that the present application describes an Acoustic Echo Canceller with Multimedia Training Signal. Reference will be made throughout to US 2007/0189508 published August 16, 2007, which is a publication of the present application under examination. Acoustic echo cancellation according to the BACKGROUND OF THE INVENTION relates to: "An acoustic echo is an undesirable condition that results from sound that emanates from a speaker being fed back into a microphone. To reduce or eliminate such echo an acoustic echo canceller is employed" [0004]. A problem for an acoustic echo canceller as defined is one of training [0005]. It is admitted that one approach to acoustic echo cancellation involves known adaptive filters. Given the environment in which, for example, a personal computer may find itself such as a personal computer in a Starbucks coffee house, it is described that the coefficients and training of the adaptive filter are a problem.

In the SUMMARY OF THE INVENTION section, [0008], it is described: "The present invention is provided on a device capable of conferencing (including videoconferencing and teleconferencing) and/or telephony (including Internet Protocol (IP) telephony) applications as well as audio applications, such that the audio applications are used to train the echo canceller in the background."

The Examiner is now referenced, for example, to FIG. 1, and elements CPU 102, ROM 106, RAM 108 including software buffer 171, and a loop shown connected to these via bus 104 comprising Sound Adapter 199 with hardware buffer 172 [0034] (an alternate or in addition to software buffer 171), microphone 151, (acoustic) echo canceller 152, speaker 150 where connections are shown between them and are further described by the specification.

The Examiner is further referred to FIG. 5, described [0017], as a block diagram illustrating an acoustic echo canceller 400 to which the present invention may be applied, according to yet another illustrative embodiment of the present invention. One skilled in the art

would understand from FIG. 5 and the description thereof in the context of the present specification and the rest of the drawings that, for example, an entertainment signal is audio output 597 of sound adapter 199 in digital form [0042]. "The acoustic echo canceller 500 is capable of operation at different audio sample rates." First 536 and second 546 sample rate converters are then introduced.

[0044] then begins: "The first sample rate converter 536 and the second sample rate converter 546 are utilized to perform sample rate conversion to match the entertainment sample rates (typically 44.1 or 48 Ksps) to the communication sample rate (typically 8 Ksps). One skilled in the art would recognize the 8 Ksps sample rate as consistent with the later described analog bandwidth: "The audio communication bandwidth corresponds to audio conferencing and telephony and may be, but is not limited to, 300 Hz to 3.3 KHz. Echo cancelling over this bandwidth will save processing power."

Thus, it is respectfully submitted that sampling rates, sampling "stage" and the like are, for example shown by FIG. 5 and its related description. Again, acoustic echo cancellation relates, for example, to adaptive filter 516.

Digital to Analog/Analog to Digital

The speaker 514 receives digital output of known sound cards, audio cards or sound adapters and outputs the same via provided but not specifically shown digital to analog converter which may comprise part of the speaker or may be associated with the speaker 514 as one skilled in the art would readily recognize. Similarly, microphone 512 receives a sound signal from an external source (such as a person on a telephone call), the microphone 512 acts as a transducer to convert sound waves to an analog electrical signal and, as one skilled in the art would understand, may be converted by an analog to digital converter that is a part of the microphone electronics or separate from it (not shown) for digital audio input 598 to computer 599. In other words, the Examiner is correct that A/D or D/A conversion would be inferred by one skilled in the art at microphone 512 and speaker 514 respectively. It would be nonsensical to think otherwise.

Finally, the Examiner states in conclusion: "For the purpose of examination, the Examiner assumes the claims are referring to the inherent step of matching the sampling rates of the training-signal (entertainment signal) with the signal-to-be-modified-via-the-training signal (the telecommunications signal input from the microphone) for the inherent purpose of aligning

up the samples so that accurate adaptations can be made." Aside from the use of the word "inherent" with which Applicants strenuously disagree, the Examiner appears to have come to a correct assumption with respect to sampling rates and matching them. But, as quoted from the specification, Applicants cannot agree with "inherent" because Applicants have stated that an advantage of such sampling and matching is to "save processing power" [0044].

Now Applicants will respond to the Examiner's rejection of the claims related to delay matching buffers.

Delay Matching Buffers

Beginning at the middle of Page 3 of the NFOA, the Examiner states: "the Examiner makes an enablement rejection to applicants' claims that recite the delay matching buffers as applicants' specification does not provide enough information for one skilled in the art to ascertain the desired delay and further how to compensate for the delay." The Examiner makes the assumption that there must be some "synchronize" activity of the software buffer 171 or the hardware buffer 172. Such is not the case, "synchronize" cannot be found anywhere in the Knutson et al. specification.

Consequently, it is appropriate for the Applicants to address the application of buffers 171 and 172 as described in the specification and shown in the drawings and as one skilled in the art would understand from the specification and drawings.

A first mention of buffers in found at [0034] with reference to FIG. 1: "The electronic device 100 further includes buffers 171 that are included in RAM 108 and also buffers 172 that are included in the sound adapter 199." One skilled in the art would understand that buffer 171 may be considered a software buffer and 172 a hardware-related buffer.

As already indicated above, FIG. 5 represents one embodiment of an acoustic echo canceller of the claims. "FIG. 5 is a block diagram illustrating an acoustic echo canceller 500 to which the present invention may be applied, according to yet another illustrative embodiment of the present invention. The acoustic echo canceller 500 is inserted between the speaker 514 and microphone 512 of a personal computer 599 having and audio input 598 and an audio output 597. The acoustic echo canceller 500 is capable of operation with different audio sample rates. The acoustic echo canceller 500 includes an adaptive filter 516, an adder 518, a multiplier 520, a first delay matching buffer 532, a first Low Pass Filter (LPF) 534, a first sample rate converter

536, a second delay matching buffer 542, a second Low Pass Filter (LPF) 544, and a second sample rate converter 546" (our emphasis added).

It is then indicated at [0045], "The first delay matching buffer 532 and the second delay matching buffer 542 are utilized to match buffer delays at the different sample rates. The buffers that are to be matched by the first delay matching buffer 532 and the second delay matching buffer 542 may be, for example, software buffers (e.g., buffers 171) and/or hardware buffers (e.g., 172) as described herein" (our emphasis added). It is respectfully submitted that one skilled in the art would be able to utilize the delay matching buffers for the described purpose. However, there is another use for the buffers in connection with other buffers as described in the specification.

At paragraph [0048]: "Since in MICROSOFT WINDOWS and other non-real-time operating systems audio is implemented by buffering data to the speakers and from the microphone, the system will operate in bursts, as instructed by the operating system, processing buffers full of data. Filter coefficient adaptation would proceed as described and illustrated with respect to FIG. 6" which relates to a flow diagram for managing processor load in relation to the adaptive filter of the various embodiments.

Then, beginning at [0049], the embodiment of FIG. 8 is discussed at [0050]-[0051]: "A playback volume control user interface 820 is capable of controlling the playback volumes of the plurality of audio sources 898. It is to be appreciated that any stream buffer delays induced prior to the plurality of audio sources 898 being input to the playback volume control user interface 820 do not apply to the echo cancellation problem. The playback volume control user interface 820 is coupled to a hardware output buffer 822 and to a WINDOWS stream buffer 824. The hardware output buffer 822 is also coupled to the speaker 814. The WINDOWS stream buffer 824 is coupled to an output delay matching buffer 826 that, in turn, is coupled to a Low Pass Filter (LPF) 828. The LPF 828 is coupled to a sample rate conversion device 830 that, in turn, is coupled to an adaptive filter 832. The adaptive filter 832 is coupled to a multiplier 834 and an adder 836. The multiplier 834 is also coupled directly to the adder 836."

Per [0051], "The microphone 812 is coupled to a hardware input buffer 840 that, in turn, is coupled to a recording control user interface 844. The recording control user interface 844 is coupled to a WINDOWS stream buffer 846 that, in turn, is coupled to an input delay matching buffer 848. The input delay matching buffer 848 is coupled to a Low Pass Filter (LPF) 850 that,

in turn, is coupled to a sample rate conversion device 852. The sample rate conversion device 852 is also coupled to the adder 826."

The connections are explained further in [0054] – [0055] with reference to FIG. 6 and FIG. 8 as follows: "It is presumed, but not necessary, that the system to which the acoustic echo canceller 800 is to be applied includes a sound card. In the case that the present invention is applied to a system having a sound card, buffers (e.g., WINDOWS stream buffers 824 and 846) are used to couple streams of samples to and from the sound card. The buffers in this case are software structures (e.g., such as buffer 171 shown in FIG. 1) that store enough samples so that WINDOWS applications can fill/empty a buffer without the buffer running out or overfilling between OS task switches. Also, there are hardware buffers on the sound card (e.g., such as buffer 172 shown in FIG. 1) for audio playback or capture (from the microphone). The buffer delays can be significant in the WINDOWS environment. Thus, the delay of the adaptive filter 832 needs to be adjusted to span the acoustic echo delay range, without the need for incorporating the buffer delays in the delay span of the adaptive filter 832. To handle up to 100 ms of echo, an absolute minimum of 800 taps are needed at 8 Ksps. More taps would be provided (e.g., 1024 taps) so that each echo can be a filter to match the phase, amplitude, and general frequency response of each echo path.

In a system where the WINDOWS buffers (e.g., such as buffer 171 shown in FIG. 1) and the hardware input buffers and hardware output buffers (e.g., such as buffer 172 shown in FIG. 1) are identical, then the delay matching buffers (e.g., buffers 826 and 846) would be non-existent. However, the delaying matching buffers 826 and 846 are included in FIG. 8 so that the path from the speaker 814 back to the adaptive filter 832 has the same delay as the path from the microphone 812 back to the adaptive filter 832" (our emphasis added). Consequently, further advantages/uses of the delay buffers are for adaptive filter control and microphone/speaker delay to adaptive filter compensation. One skilled in the art would understand the latter is calculable from the predetermined delays of the described paths. Moreover, the latter may vary from computer to computer 499, 599, 799 or in FIG. 8 (where the "personal computer" may have "a plurality of audio sources 898" [0049].

Further description of buffers found at [0060]-[0061] where one skilled in the art would understand a software buffer 171 is described whereby processor load reduction can be achieved by use of buffers: "Adaptation and filtering are only completed during every adapt call to the

method/routine of FIG. 6. Otherwise, data is only stored in the filter input buffers (but adaptation is not performed), reducing the computational load from 2n operations per sample to one operation per sample, where n is the number of taps in the filter, given a full-band LMS echo canceller. Thus, it is determined whether the value of the adaptive counter is greater than or equal to a pre-specified adaptive counter comparison value (step 620). If so, then the value of the adaptive counter is reset (to zero) (step 625), and the method proceeds to step 630. Otherwise the input buffers and the adaptive filter buffers are updated, but the adaptive filter is not operated (step 655), and a return is made to the operating system." Further description is provided at paragraphs [0064] and [0068] but the essence of the utilization of the delay matching buffers has already been discussed. Thus, in summary, Applicants are not "synchronizing" as assumed by the Examiner. Rather, one skilled in the art would know to utilize delay matching buffers in the manner indicated by the specification.

At Page 4, first complete paragraph, it is asserted with respect to claims 1, 6, 7, 8 and 27 that "the applicant has not provided any specific details as to how the system would monitor the total load on the processor (or even every process handled by the processor). Further, the applicant has not provided and timing diagrams or algorithms by which the processor determines average load. Applicants will now address Processor Load.

Processor Load

One skilled in the art of computers and operating systems in which the present acoustic echo canceller is employed would readily recognize that the operating system may provide such output as indications of load. Even a lay person frequently may look to the performance indicator typically provided on a personal computer that indicates load, for example the performance tab on the WINDOWS ® Operating System Task Manager window. As described, for example, in paragraph [0058]-[0059]: "Adaptation and filtering are only practical when audio is coming out of the system. Either an audio application must be running, or the Operating System (OS) must generate a sound. Thus, it is determined whether an audio application is currently being executed by the OS or whether the playing of a sound is being initiated by the OS (step 605). If so, the method proceeds to step 610. Otherwise, a return is made to the operating system. It is to be appreciated that the sound may be, but is not limited to, a sound relating the arrival of an e-mail, an indication sound of some event (e.g., a notification of an incoming call, a conference call reminder, a warning, etc.), and even a pre-specified sound sequence also used for

a purpose other than solely training the echo canceller." It is respectfully submitted that the Examiner suggestion of timing diagrams and the like to show processor determination of average load is inapplicable. To the contrary, FIG. 6 and its attendant description is urged to provide thorough details of a processor load algorithm. The specification continues in [0060] already quoted above, and [0061]-[0065]. It is respectfully submitted that the specification and FIG. 6 provide ample discussion of processor load and the use of an adaptive counter for acoustic echo canceller control.

The Examiner then introduces a "double-talk detector" at Page 4 as providing a well-known function of adaptive filter/audio training without citing to a particular reference. Applicants will now address a Double-talk Detector.

Double-talk Detector

To the extent understood by Applicants, double-talk detection relates to near end/far end signal detection. The acoustic echo canceller described by the Knutson et al. specification is directed at the training of an acoustic echo canceller per FIG. 1 or FIG. 5, for example, where, for example, computer 599 is or may be involved in, for example, internet or IP telephony. A double-talk detector suspends or reduces echo canceller adaptation in the presence of bi-directional voice communications. To the contrary, the present application is directed to background training of an acoustic echo canceller, and one would not look to the art of double-talk detection for background training of an acoustic echo canceller. Double talk detection may be added to an IP telephone PC system, but a double talk detector appears to teach nothing that assists in background training of an acoustic echo canceller. The Examiner is requested to explain his position further with some citation to a reference so that Applicants may better understand the Examiner's comments. However, without a specific citation to an embodiment of a double-talk detector that relates to an acoustic echo canceller having background training using an entertainment signal audio output 597 from a sound adapter, audio card, sound card 199, Applicants cannot effectively respond to the Examiner's assertion.

Entertainment

At Page 5, Section 2, the Examiner rejects claims 1-27 as indefinite for use of the phrase "entertainment." The Examiner alleges that the phrase is not clearly defined. Yet, entertainment is defined by way of example, for example, at [0024], entertainment is defined by way of example: "entertainment (e.g. music, multimedia, etc.)." At paragraph [0044], it is stated: "at

high sample rates for entertainment quality audio" where it is recognized that audio music, for example, may involve a high sampling rate in order to enjoy if played as an analog signal through a speaker. There is provided a grocery list of what may be considered entertainment that falls within this definition at paragraph [0047]: "video games, playing MP3s, CDs, or other audio files, playing video files." Finally, at paragraph [0064], it is stated: "What the microphone hears is not being used in communications when entertainment applications are running." In summary, the Examiner is referred to the following paragraphs for entertainment, application and sound adapter: [0024], [0029], [0044], [0047], [0054] and [0064]. It is respectfully submitted that one skilled in the art would readily appreciate the meaning of "entertainment sound adapter" and "entertainment application" by way of the examples provided in the specification of "entertainment," entertainment applications and a sound card, audio card, sound adapter used for "entertainment."

The Examiner again comments on claims 6-8 and 27 that average load and processor load are unclear. The Examiner is referred to the specification, drawings and the discussion above of these terms. It is respectfully submitted that one skilled in the art would understand these terms from the specification (for example, paragraphs [0058] and [0059].

Depending on the average processor load, different approaches can be taken to adapt the acoustic echo canceller filter. Thus, at step 610, it is determined whether the average processor load is low or high. If the average processor load is low, then the acoustic echo canceller can operate continuously, using all audio samples (step 650), and then a return is made to the operating system. Otherwise, if the average processor load is high, then the filter is adapted intermittently. To adapt the filter intermittently, a counter (hereinafter "adaptive counter") is used, and a value of the adaptive counter is incremented (step 615). It is to be appreciated that the present invention is not limited to the use of a counter to intermittently adapt the adaptive filter and, thus, other approaches may also be employed while maintaining the spirit of the present invention.

Claim Rejections – 35 USC 103

The Examiner at Pages 6-12 provides a detailed rejection based on Nyhart et al., US 5,553,137. The Examiner responds to Applicants' arguments and, at one point, indicates that "As per Applicants' argument that Nyhart's background section teaches away from applicants'

claims, the Examiner does not understand applicant's argument and requests clarification. The Examiner maintains that Nyhart reads on applicants' claims as per the above rejections."

Applicants will address this point out of sequence of the Examiner's stated rejections because Applicants believe that understanding Nyhart and the sidetone echo it is canceling versus the disclosure and claims of the present invention is key to an appreciation of the differences between Nyhart et al. and the claimed structure of claims 1-27.

Claim 1 is repeated here for clarification: A method comprising:

implementing a telecommunications application of an electronic device, said electronic device comprising one of a personal computer and a peripheral device for use with personal computers;

sampling a telecommunications signal of said telecommunications application at a first sampling rate; and

utilizing sound output of an entertainment sound adapter of said electronic device, said entertainment sound adapter output being sampled at a second higher sampling rate than said first sampling rate, said entertainment sound adapter output corresponding to a non-training audio application of said electronic device to train an acoustic echo canceller in a background of said telecommunications application.

The method of claim 1 is clearly described and supported as discussed above, for example, by FIG. 1 and FIG. 2. Acoustic echo cancellation is defined as the echo resulting from "sound that emanates from a speaker being fed back into a microphone." Nyhart et al. relates to a different type of echo – sidetone echo: "Many telephone systems, particularly cordless telephone systems, are defined to operate in urban environments which have a high level of ambient noise. In telephony, sidetone is defined as an attenuated level of one's own voice heard in the telephone handset ear piece. In telephony systems in which there is a delay to the audio path, the sidetone produced by the 4 wire to 2 wire reflection (from a conversion hybrid such as "standard hybrid" 128) will sound like echo. This (sidetone) echo can be annoying to the user to the point of disrupting the ability to communicate on the telephone." See also col. 2, ll. 63-66. Hence, per Nyhart FIG. 1, the Nyhart echo cancellation of sidetone echo involves the base station 102 and the controller 122, DSP 124 and hybrid 128 with paths 130. Microphone 106 and speaker 108 have nothing to do with sidetone echo cancellation. The Examiner fails to appreciate the difference between sidetone echo cancellation and acoustic echo cancellation.

The Examiner fails to appreciate the difference between an electronic device such as a personal computer and peripheral and a cordless telephone. The Examiner fails to appreciate the significance of sampling at first and second sampling rates where, for example, entertainment audio is sampled at a high rate and telephony at a low rate and matched at the lower rate as indicated above for the advantages indicated above. Moreover, and most importantly, the Examiner fails to appreciate: "said entertainment sound adapter output corresponding to a non-training audio application of said electronic device to train an acoustic echo canceller in a background of said telecommunications application."

Nyhart only mentions microphone 106 and speaker 108 once in Nyhart's entire specification.

Until the Examiner is able to understand that there is a clear difference between an acoustic echo canceller and associated structure and a sidetone echo canceller and related structure, Applicants continue to maintain their position that claims 1-27 are patentably unobvious in view of Nyhart or applicants' admitted art applied thus far by the Examiner.

Applicants respectfully request an interview with the Examiner to discuss independent claims 1, 10, 12, 21 and 23 and must respectfully repeat the same arguments and remarks made previously in response to the plurality of office actions issued in this application. Applicants respectfully submit that a dialog with the Examiner may result in an understanding by both of each other's respective positions and perhaps to passage to issue of the present application.

The Examiner in the most recent NFOA rejects claims 1-4, 9-15, 20-22 and 27 under 35 USC 103(a) as being anticipated by Nyhart et al. (5,553,137). The Examiner further rejects claims 5, 7-8, 16, 18-19 and 23-26 under 35 USC 103 as being unpatentable over Nyhart et al. (5,553,137) (hereinafter, Nyhart) as applied to claims 1 and 12. The Examiner rejects claims 6 and 17 under 35 USC 103 as being unpatentable over Nyhart as applied to claims 1 and 12 and further in view of applicant's admitted prior art (spec). The Examiner states "Applicant's admitted prior art discloses well known adaptive filters used to perform echo cancelling. The digital system inherently comprises means to delay all signal paths so as to synchronize the signals (to give 'real time' bidirectional communication.) (spec. pages 1 and 2). It would have been obvious to one of ordinary skill in the art at the time of this application to implement well known echo canceller features like a filter and delay means for the purpose of implemented the disclosed canceller" (our emphasis added). It cannot be stated enough that Nyhart and Knutson

et al. provide different echo cancellers in different structures and their methods are for different purposes.

Again, the "admitted prior art" at pages 1 and 2 of the specification comprises a reference to adaptive filters used to perform echo cancelling. Indeed, an "adaptive filter" is disclosed at page 1, lines 15-23, where it is further stated that "the stored coefficients will be invalid or possibly worse than starting from a zero coefficient point." On page 2, it is stated: "Another approach involves reducing the local speaker volume when a local user is speaking into the microphone so as to reduce the canceling requirements of the adaptive filter." Nyhart fails to address these problems, barely mentioning a microphone and a speaker of a cordless phone.

Consequently, the Examiner's use of so-called admitted prior art is respectfully traversed as teaching anything other than what is stated in the specification. The Examiner must provide some citation to a reference which teaches what the Examiner alleges the prior art teaches beyond the admitted prior art at pages 1 and 2 of the specification, for example, "The digital system inherently comprises means to delay all signal paths so as to synchronize the signals. . ."

With respect to "inherently comprises means to delay," the Examiner states: "It is well known to buffer and delay processing stages in order to synchronize realtime bidirectional communication systems. . . . Applicant has not disclosed the implementation specifics of any of the claimed device . . . (as quoted above). . . it is well known to implement functions and algorithms digitally, using processing, buffering and delay stages for the purpose of implementing the disclosed synchronized bidirectional communications systems."

The Examiner responds to arguments as follows: "One of ordinary skill in the art would realize that prior art systems existed and could benefit from obvious combinations, such as the one from Nyhart."

The Examiner states that he "does (not) understand applicant's argument" that "Nyhart's background section teaches away from applicant's claims" and "requests clarification." Also, the Examiner disagrees "that Nyhart's noise sequence is not a specially designed sequence."

Features of claimed embodiments missing from Nyhart

We now again summarize the allegations of the Examiner regarding Nyhart and identify features of claimed embodiments missing from Nyhart. Nyhart allegedly teaches non-training audio according to the BACKGROUND (paragraph 2 of the Office Action) regarding claims 1, 2, 12 13 and 21. The Examiner states that the non-training audio may be "audio" regarding

claims 3, 10, 11, 14 and 22. Further claims are also discussed with no specific reference to any support in Nyhart.

There is a discussion in the Nyhart BACKGROUND of using "sidetone" which is the intentional combination of microphone pick-up to be heard by the near end caller or background noise which can result in the following: "an increased chance that the near end user will begin speaking before convergence. This in turn results in the near end user initially hearing his sidetone as the canceller converges. If the noise level is increased to a level higher than background noise, the far end user may hear the added noise for the duration of the training of the canceller." Thus, the approaches taken in Nyhart's BACKGROUND have problems that remain unsolved and teach away from Applicants' claims involving an acoustic (not a sidetone) echo canceller. They teach away from Applicants' claimed embodiments because Nyhart has no concept of utilizing sound output of an entertainment sound adapter of an electronic device to train an acoustic echo canceller of the device in a background of a telecommunications application. Nyhart strictly relates to telecommunications and, in particular, "In response to noise generated between the dialing of digits, the echo canceller converges on noise to optimize sidetone," (Nyhart, col. 2, ll. 1-4) Nyhart involves "first and second radios and a base station having an echo canceller," (Nyhart, col. 1, ll. 57-60) where the echo canceller is a sidetone echo canceller.

As introduced in the Nyhart ABSTRACT, Nyhart teaches and suggests training "on noise generated by the echo canceller (124) during inter digit dialing." In particular, at col. 3, ll. 11-28, the DSP 124 generates low level white noise in a pseudo random (PN) sequence onto the two wire phone line 126 during inter digit dialing with the result: "The echo canceller 124 is thus trained during the inter digit dialing time before two way communication between the near end and far end users is established." This is not a disclosure or suggestion of Applicants' claimed embodiments using an entertainment sound adapter.

Applicants' claims as amended clearly recite distinctions and features that one of ordinary creativity or one using common sense (see *KSR v. Teleflex guidelines re "obviousness"*) in view of Nyhart or the admitted prior art would not obtain without the use of improper hindsight reconstruction. Moreover, Nyhart and the admitted prior art teach away from the recited non-training audio application, for example, an entertainment application playing in the

background of a telecommunications application having a first sampling rate and the non-training audio application having a second, higher sampling rate.

The Examiner restates his position that : "an echo canceller could be implemented on a phone (which is also a conferencing device) or computer with a known interface that produces the *external* audio signal for training for the purpose of removing echoes from those devices." This truly admits of hindsight reconstruction. Nyhart fails to discuss any other external audio signal than noise generated as low level white noise by DSP 124 (col. 3, ll. 12-28). This is not a disclosure, for example, of "utilizing sound output of an entertainment sound adapter of said electronic device, said entertainment sound adapter output being sampled at a second higher sampling rate than said first sampling rate, said entertainment sound adapter output corresponding to a non-training audio application of said electronic device to train the acoustic echo canceller in a background of said telecommunications application." Nyhart has no entertainment sound adapter and is not an electronic device as recited. There is no concept in Nyhart of an "external audio signal" other than low level white noise. It is not sound output of an entertainment sound adapter of an electronic device. Per claim 2/1, Nyhart, for example, has no "entertainment application" or "program audio" which clearly differentiates from noise. Claim 3/2/1 specifies "streaming audio sound" which is not white noise.

An advantage of embodiments involving an adaptive filter as an acoustic echo canceller using background training via an entertainment sound adapter is that "background training would not need to operate continuously" as stated at page 13 of the specification (paragraph [0047] of the published application): "idle cycles of the processor can be used to train the echo canceller whenever the speaker is used, whether in video games, playing MP3s, CDs, or other audio files, playing video files, or even during the typical bells and whistles of the PC alerting the user to emails and other warnings." Consequently, no PN noise generation is required as in Nyhart. An entertainment sound adapter of an electronic device is present for other purposes than acoustic echo canceller training. Applicant's amended claims discuss an entertainment sound adapter that is used for non-training and for training of an acoustic echo canceller. The Examiner does not address this advantage. The Examiner is referred to MPEP 707.07(f): ANSWERING ASSERTED ADVANTAGES. Nyhart is not background training. While Nyhart training occurs during interdigital dialing and so does not need to operate continuously, Nyhart is limited to

operating only during a brief portion of a "telecommunications application" and certainly not in a background of a telecommunications application.

Claim 2/1 as amended reads, for example: "the non-training audio application is an entertainment application," and there is no entertainment application in Nyhart and no "entertainment sound adapter output" or output that includes "program audio". White noise is not entertaining and is not program audio. To the contrary, white noise is annoying.

Claim 3/2/1 as amended refers to streaming audio sound, and Nyhart fails to refer to "streaming audio sound."

Claim 4/1 discusses an entertainment application of a personal computer, and Nyhart fails to discuss such an application, for example, music and multimedia.

Claim 5/1 relates to matching sample rates as supported at paragraph [0044] to communication sampling rates. The Examiner cannot produce "sample rate conversion" out of thin air from Nyhart – the alleged inherent composition is clearly impermissible hindsight reconstruction of claim 5 from absolutely no disclosure in Nyhart of sample rates, their conversion or matching.

Claim 6/1 relates to "a microphone" and "a speaker" of "said electronic device" of claim 1 which admittedly may be associated with a telecommunication application but must be construed in the context of claim 1. Moreover, an adaptive filter is recited along with paths to the speaker and the microphone. Nyhart does not discuss these features in the context of claim 1 including an entertainment sound adapter. Nyhart barely mentions microphone 106 and speaker 108 of handset 104 and so does not relate at all to acoustic echo cancellation.

With respect to claim 7/6/1 and 8/7/6/1, the examiner states that it would be obvious to balance and manage processor resources. Yet, the Examiner provides no support in Nyhart or any reference to any balancing as recited when both a telecommunications application and a non-training audio application are playing with the latter playing in a background for acoustic echo canceller training. Nyhart only appears to run a communications application. Referring to FIG. 6, there exists a loop 601, 605, 610 which is support for a "processor load, high or low" box (610) and running a canceller continuously (650 when low) depending on the result.

Claim 9/8/7/6/1 is rejected based on another inherency argument. Yet, the examiner fails to cite to any reference related to, for example, "an adaptive counter to count a number of training calls to the acoustic canceller." The Examiner is again referred to FIG. 6 and the loop

601, 605, 610, 615, 620, 655 where (605) represents "audio application/other sound." If the load is high at (610), incrementing an adaptive counter (615) where if the adaptive counter value is greater than a value (620), the filter is not operated (655). Adaptive counter 854 is introduced at paragraph [0053] and further discussed at paragraphs [0057]-[0062]. Nyhart has no such adaptive counter and fails to discuss the features of claim 9/8/7/6/1.

Claim 10 is an independent claim related to a further embodiment involving "a sequence of frequencies" and "an event unrelated to training." Nyhart arguably during digit dialing outputs "a sequence of frequencies" such as so-called touch-tone dialing frequencies (the Examiner may consider white noise a sequence of frequencies), but Nyhart teaches interdigital training, not during digits. As suggested above, Nyhart does not discuss "utilizing sound output of an entertainment sound adapter of an electronic device . . ." Claim 11/10 defines the event unrelated to training as some event other than outgoing calls involving interdigital dialing so Nyhart does not discuss the recited event.

Claim 12 is an independent claim that relates to an acoustic echo canceller involving "an entertainment sound adapter of an electronic device" and "an adaptive filter adapted to be trained using sound comprising audio output of said entertainment sound adapter" and related features not discussed by Nyhart.

Further claims contain similar features to those already discussed which are not disclosed in Nyhart and are not inherent in Nyhart as suggested by the Examiner. Again, it is respectfully submitted that all such inherency arguments are improper hindsight reconstruction of Applicants' claimed embodiments and requests that some reference be cited which provides a discussion of the alleged inherent component or feature.

Again, at best, Nyhart and the admitted prior art together teach PN sequence noise generation during inter-digit dialing and an adaptive filter for sidetone echo cancellation which has nothing to do with acoustic echo cancellation. Claims 1-27 contain features undisclosed by the cited and applied prior art such as an entertainment sound adapter.

Applicants respectfully request reconsideration of the rejection of claims 1-27 and look forward to prompt allowance of the application. The Examiner is urged to contact Thomas Jackson, Registration No. 29,808, located in the District of Columbia to schedule an interview which may include Paul Knutson to answer questions and establish a dialog in this application which may lead to allowance and not impasse. Should the Examiner have any questions on this request, the Examiner is urged to contact the undersigned attorney of record at the telephone number and address given.

Respectfully submitted,
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